PREPARATORY COMMITTEE FOR THE
1995 CONFERENCE OF THE PARTIES
TO THE TREATY ON THE NON-PROLIFERATION
OF NUCLEAR WEAPONS

NPT/CONF.1995/PC.III/8
5 August 1994
ENGLISH
Original: ENGLISH

Third session
Geneva, 12 - 16 September 1994

ACTIVITIES OF THE INTERNATIONAL ATOMIC ENERGY AGENCY RELEVANT TO ARTICLE IV OF THE TREATY ON THE NON-PROLIFERATION OF NUCLEAR WEAPONS

Prepared by the Secretariat of the IAEA for the 1995
Conference of the Parties to the NPT

94-32674

TABLE OF CONTENTS

1. INTRODUCTION

1.1 The legal framework
1.2 Mechanisms for technology transfer

2. TECHNOLOGY TRANSFER THROUGH THE AGENCY'S REGULAR PROGRAMME

2.1 International Nuclear Information System (INIS)
2.2 Meetings and publications
2.3 Centres and laboratories (Seibersdorf, Monaco, Trieste)
2.4 Research Contract activities
2.5 Examples of activities within the Agency's Regular Programme with a large component of technology transfer

3. TECHNOLOGY TRANSFER THROUGH THE TECHNICAL CO-OPERATION ROGRAMME

3.1 TC Programme areas
3.2 Types of assistance provided
3.3 Funding the TC Programme
3.4 Technical Co-operation and NPT

4. TRENDS IN THE TC PROGRAMME

4.1 Diversity of conditions and needs
4.2 Increased inter-country co-operation
4.3 Increased attention to radiation protection, nuclear safety and radioactive waste management

5. STRENGTHENING TRANSFER OF TECHNOLOGY

5.1 Enhancing technical co-operation
5.2 Achieving and maintaining a high level of nuclear safety

6. CHALLENGES TO TECHNICAL CO-OPERATION

6.1 The environment and sustainable development
6.2 New Member States and their needs
6.3 Impact of technical co-operation
6.4 Advanced technologies and techniques
6.5 Public acceptance of nuclear technology

7. MEETING THE CHALLENGES

7.1 Redirection of technical co-operation activities
7.2 Meeting the needs of Member States

8. CONCLUSION

Glossary

Annex - Voluntary contributions to the Technical Assistance and Co-operation Fund for 1993

1. INTRODUCTION

Article IV of the NPT stipulates that,

"1. Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II of this Treaty.

2. All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also co-operate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world."

While transfer of technology, in this context, also takes place through bilateral and other multilateral channels, the IAEA serves as the key international mechanism for scientific and technical co-operation in the promotion of the peaceful use of nuclear energy and has played and continues to play an important role in the transfer of nuclear techniques to the developing areas of the world.

According to its Statute, the IAEA has pursued the twin and mutually reinforcing goals of promoting the peaceful benefits of atomic energy and verifying that nuclear materials and facilities placed under its control are used for peaceful purposes.

The IAEA General Conference has on several occasions confirmed its continuing support for an adequate balance between those of the Agency's programmes which aim at making more widely available the benefits of peaceful uses of nuclear energy and those which are designed to ensure that nuclear material is not diverted for military purposes (the safeguards system). The NPT, negotiated more than a decade after the creation of the Agency, reflected the same philosophy and the twin goals have been reconfirmed by successive NPT Review Conferences.

1.1. The Legal Framework

Facilitating the exchange of equipment, material and scientific and technological information for the peaceful uses of nuclear energy, and facilitating co-operation between Member States for this purpose, as envisaged by Article IV of the NPT, are key statutory functions of the IAEA.

Article III of the IAEA's Statute authorizes the Agency, *inter alia*:

- "to encourage and assist research on, and development and practical application of, atomic energy for peaceful uses throughout the world; and, if requested

to do so, to act as intermediary for the purposes of securing the performance of services or the supplying of materials, equipment, or facilities;"

- "to meet the needs of research on, and development and practical application of, atomic energy for peaceful purposes, including the production of electric power, with due consideration for the needs of the under-developed areas of the world;"

- "to foster the exchange of scientific and technical information on peaceful uses of atomic energy;"

- "to encourage the exchange and training of scientists and experts in the field of peaceful uses of atomic energy."

1.2. Mechanisms For Technology Transfer

Implementation of the above objectives and functions is undertaken by the Department of Technical Co-operation and two technical departments, the Department of Research and Isotopes and the Department of Nuclear Energy and Safety. While technology transfer through technical departments forms part of the Agency's Regular Programme and is financed through the Regular Budget, technical assistance provided by the Department of Technical Co-operation is funded largely from voluntary contributions of Member States.

2. TECHNOLOGY TRANSFER THROUGH THE AGENCY'S REGULAR PROGRAMME

The major technology transfer activities carried out under the Regular Programme include information exchange through symposia, seminars, conferences and technical committee meetings, co-ordinated research programmes, publications, support activities and many other activities of interest to Member States. Examples of such activities are given in Sections 2.1 to 2.5.

2.1. International Nuclear Information System (INIS)

INIS continues to be one of the Agency's principal channels for disseminating scientific and technical information. The system covers virtually every aspect of the peaceful uses of nuclear energy. In 1993, the database of the system contained over 1.7 million records and is growing at a rate of almost 90,000 records a year. Over 278,000 documents are stored and can be provided on microfiche.

As can be seen from **Figure 1**, participation in INIS has steadily increased since 1970. At present, this participation corresponds to 65 developing and 21 industrialized Member States as well as 17 international organizations. Most INIS system products are available to developing countries free of charge or at nominal fees.

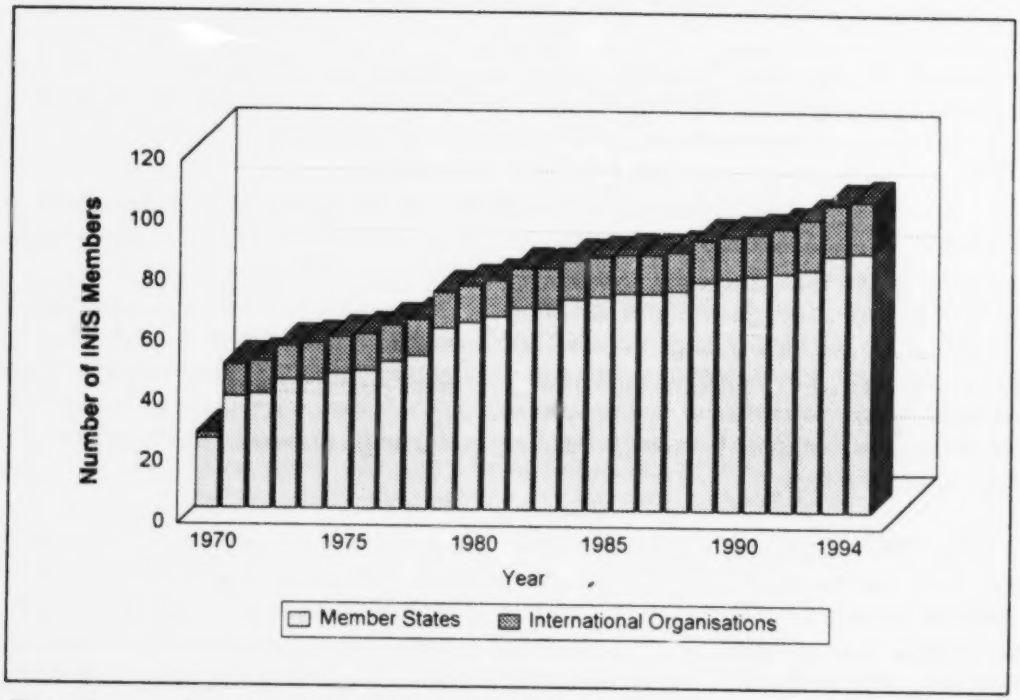

Figure 1 Annual growth of INIS membership since 1970.

2.2. Meetings and Publications

The Agency holds some 400 meetings on various topics in nuclear science and technology annually, including 10-14 major conferences, symposia and seminars, as well as a wide range of advisory group, technical committee and consultants' meetings. Most of these meetings deal with nuclear applications and techniques which are of direct benefit to developing countries and are thus in line with the objectives of technology transfer.

For various reasons, but mainly owing to financial constraints, participation in these meetings of scientists and specialists from developing Member States continues to be relatively low. For the period 1989 - 1993 the annual proportion of participants from developing countries at the Agency's major meetings fluctuated between 28% and 36%. During these five years, the attendance of 649 (28%) of the 2326 participants from developing countries who attended major meetings was funded by the Agency.

Many meetings, projects and programmes of the technical departments result in publications and technical documents which are widely disseminated to Member States. In 1993, developing countries received over 116,000 copies of IAEA publications, including cost free proceedings, technical documents, bulletins, newsbriefs, etc.

2.3. Centres and Laboratories (Seibersdorf, Monaco, Trieste)

Alone among other international organizations, the IAEA operates its own research and service laboratories, which contribute significantly to the transfer of nuclear technology to Member States.

The Agency's laboratories at its Headquarters in Vienna and at **Seibersdorf**, near Vienna, provide directly to Member States a diversity of technical services for programmes in physics, chemistry, hydrology, nuclear instrumentation and agriculture to assist developing countries to solve a variety of problems. The services provided in agriculture cover soil fertility, irrigation and crop production; plant breeding and genetics; animal production and health; insect and pest control; and agrochemicals. Three principal mechanisms are used by the laboratories for transferring selected techniques and technologies to national research institutions: training courses, on-the-job training, and laboratory services.

The IAEA **Marine Environment Laboratory, Monaco,** carries out studies of pollution and radioactivity in the marine environment, collaborating with oceanographic institutes worldwide and undertaking projects in co-operation with other international environmental programmes and institutions combining nuclear and non-nuclear techniques. The Laboratory participates in international experiments, marine pollution assessments and research at the request of Member States. It also conducts training courses and laboratory intercomparison exercises.

The **International Centre for Theoretical Physics (ICTP),** financed jointly by the Italian Government, UNESCO and the Agency, with some additional funds made available by other donors, is an important mechanism for the exchange and transfer of advanced scientific knowledge and skills. The main objectives of the Agency's involvement in these activities are: to foster the growth in developing countries of advanced studies and research in the physical and mathematical sciences, especially at the interface with technology; to provide an international forum for scientists from all countries; and to provide facilities to enable visitors, associates and fellows to conduct original research. The Centre is active in many scientific fields, including fundamental physics, condensed matter physics, mathematics, physics and energy, physics and the environment, physics and the living state, and applied physics and technology.

Over 4500 scientists participated in research and training activities carried out at the Centre in 1993, of which 57% came from developing countries. The Centre has 441 Associate Members and 376 Federated Institutes in developing countries.

The ICTP disseminates a great volume of scientific information. In 1993, it distributed 31,985 journals, 6060 proceedings and 261 books to 400 institutions in 70 developing countries.

The administrative responsibility of the Agency for ICTP will be transferred to UNESCO as soon as the agreements are finally accepted by all parties. But the Agency will still continue to support the Centre technically and financially.

2.4. Research Contract Activities

Through the Research Contract activities, the IAEA unites researchers in developing and industrialized countries in progress toward common research goals. These contracts offer guidance to scientists from the developing world and provide opportunities for scientists in all Member States to communicate freely and exchange information on research activities.

Technology transfer is carried out by placing contracts and agreements with research centres, laboratories, universities and other institutions in Member States to conduct research projects in relation to their scientific programmes. Most of these contracts and agreements are components of **Co-ordinated Research Programmes (CRPs)** — research endeavours planned by the Agency which give groups of scientists the opportunity to co-operate in tackling a common problem. Contracts offered under this programme provide a nominal award, currently averaging about $5000 per annum.

Figure 2 shows the steady growth of Research Contract activities, financed from the Agency's Regular Budget, since the establishment of the NPT. In the **last ten years** the Agency has in this way financed research activities totaling **$39.2 million** from the Regular Budget. During the same period, additional extrabudgetary contributions to the programme totalling $ 46.3 million have also been received from Australia, France, Germany, Italy, Japan, the Netherlands, Sweden and the United States of America.

As an alternative to Research Contracts, which always include financial support, Research Agreements are also concluded with institutes to enable them to participate in the Research Contract Programme. These agreements are similar in nature to the contracts, but do not provide funds to the participating institute.

Research is currently being supported by the Agency under this programme in the broad fields of radioisotope and radiation applications, the protection against ionizing radiation, the conservation of the environment and nuclear fuel cycle technologies. About three quarters of the programme supports research endeavours in applications of nuclear techniques, while a quarter of the activities relate to nuclear power and safety. Research work is currently being carried out under 1900 research contracts and agreements in more than 90 Member States and involves participation in some 150 CRPs.

For the transfer of scientific knowledge, 80 Research Co-ordination Meetings (RCMs) were held in 1993 in respect of 144 on-going Co-ordinated Research Programmes. 117 publications have resulted from the 26 CRPs completed and evaluated in 1993, (30 books and 87 scientific articles).

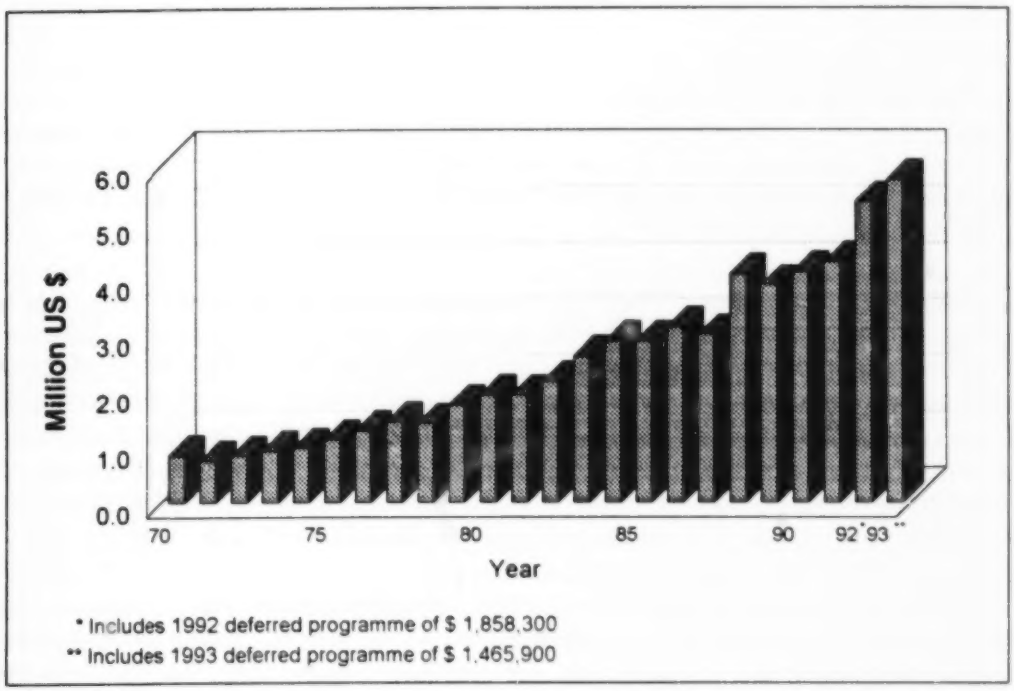

Figure 2 The Research Contract Programme since 1970, financed from the Regular Budget.

2.5. Examples of Activities within The Agency's Regular Programme with a Large Component of Technology Transfer

Examples of activities within the Agency's Regular Programme with a large component of technology transfer can be found in the Agency's Annual Reports. The following examples of such activities in 1993 have been selected to illustrate the IAEA effort and contribution to the transfer of technology.

In **food and agriculture**, the use of isotopic tracers in Co-ordinated Research Programmes have led to increased efficiency of phosphorus uptake by crops and in studying the rate of soil erosion; the use of neutron moisture guages have led to improved water use efficiency in irrigation systems.

A CRP on the radiation induction of mutation in breeding rape seed for oil has led to the release to farmers of three mutant varieties in Bangladesh and China, and in sesame the release of 19 mutant varieties in Egypt and the Republic of Korea. Significant progress has also been made using radiation induced mutations in improving plant architecture and in modifying seed oil quality and content.

Other CRPs completed in agriculture cover a wide variety of livestock species (cattle, sheep, goats, llamas, alpacas, camels and buffaloes) and agroecological zones in Africa, Asia and Latin America. These programmes focused on the use of isotopic methods to define nutritional and reproductive problems for the production of milk, meat and fibre, and on researching ways to overcome constraints in a cost effective manner.

A CRP for Asia and the Pacific, Africa and the Middle East on the **application of isotope and geochemical techniques in geothermal exploration** ended. Institutes from 11 countries carried out investigations in low temperature geothermal areas on the southeast Asia coast (China and Viet Nam) and on the Korean peninsula (Republic of Korea), in medium temperature areas in the Himalayas (India and Pakistan), and in high temperature fields in Iceland, Indonesia, Italy, New Zealand, the Philippines and Turkey. Isotope techniques have helped understand the hydrology of geothermal areas in order to identify the location of the resources and in particular to identify the most suitable sites for drilling the production wells.

In the application of nuclear techniques in the field of **human health,** an interregional seminar was held in Vienna where information was presented on recent advances in the application of radionuclides in the diagnosis and management of disorders of the kidney and the urinary and gastrointestinal tract. Progress was made through a CRP on optimizing radionuclide based molecular techniques for the diagnosis of tuberculosis and blood borne diseases such as hepatitis, Chagas disease, AIDS and malaria.

In the field of **industry, earth sciences and environment**, a symposium was held on the application of isotope techniques in studying past and current environmental changes in the hydrosphere and the atmosphere. The symposium demonstrated that isotopes are among the most powerful tools to investigate past environmental and climatic changes and their causes and that these studies could help to formulate hypotheses and predict changes in the 21st century.

The following examples may be given regarding the Agency's Regular Programme activities in recent years in **nuclear power related areas**.

The Agency convened a meeting in 1993 of international organizations to establish an Inter-Agency project (DECADES) on databases and methodologies for comparative assessment of different energy sources for electricity generation in terms of their impact on environment, health and other relevant parameters. The project is being carried out jointly by nine international organizations (the IAEA, CEC, ESCAP, IBRD, IIASA, OECD/NEA, OPEC, UNIDO and WMO) under the supervision of a Joint Steering Committee of representatives of all the participating organizations. The results will be presented and discussed at a Symposium on Electricity, Health and the Environment, to be held in 1995. This work is also the basis of the Agency's contribution to the activities of the Inter-Governmental Panel on Climate Change (IPCC) and of the United Nations Inter-Agency Committee on Sustainable Development (IACSD).

In 1989, the Agency started activities in nuclear energy for sea water desalination under a plan for producing potable water economically. A report has been prepared containing a review of the most up-to-date of desalination processes and possible coupling schemes with nuclear reactors. At the same time, the IAEA is assisting countries (in particular from North Africa and Saudi Arabia) in feasibility studies on sea water desalination using nuclear energy.

A special report, "Policy Planning for Nuclear Power: An Overview of the Main Issues and Requirements" was published. This document, in non-technical language, reviews political, governmental, economic, financial and technical issues that must be dealt with by a government prior to and during the commitment to a safe, economic and reliable nuclear power programme.

As regards the **nuclear fuel cycle**, recent activities of particular interest to developing countries are:

- Elaboration of documents on uranium exploration and production, including environmental impact assessments.

- Preparation of technical documents on handling, treatment, conditioning and storage of radioactive waste, with emphasis on quality assurance and minimizing waste.

3. TECHNOLOGY TRANSFER THROUGH THE TECHNICAL CO-OPERATION PROGRAMME

The main part of the Agency's technology transfer to Member States is undertaken through its Technical Co-operation Programme (TC Programme), administered by the Department of Technical Co-operation. This consists of projects requested by Member States and approved by the Board of Governors and covers all geographic regions and all aspects of nuclear energy for power and non-power applications. In 1993, the programme comprised more than 1200 projects in over 80 developing countries. Details of this programme are given below.

In view of the size, scope and nature of the assistance provided, the TC Programme has specific conditions for implementation. Thus within the framework established by the statutory provisions referred to in Section 1.1 above, the delivery of the Agency's technical assistance is regulated by "**The Revised Guiding Principles and General Operating Rules to Govern the Provision of Technical Assistance by the International Atomic Energy Agency**", approved by the Board of Governors and issued in 1979 [INFCIRC/267]. The provision of the assistance is further regulated by a supplementary agreement which should be concluded by the Agency and a recipient Member State ("**Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the International Atomic Energy Agency**"). Both documents contain, *inter alia*, provisions concerning exclusively peaceful use of technical assistance provided through the IAEA TC Programme and the Agency's Safety Standards and Measures applied to such assistance.

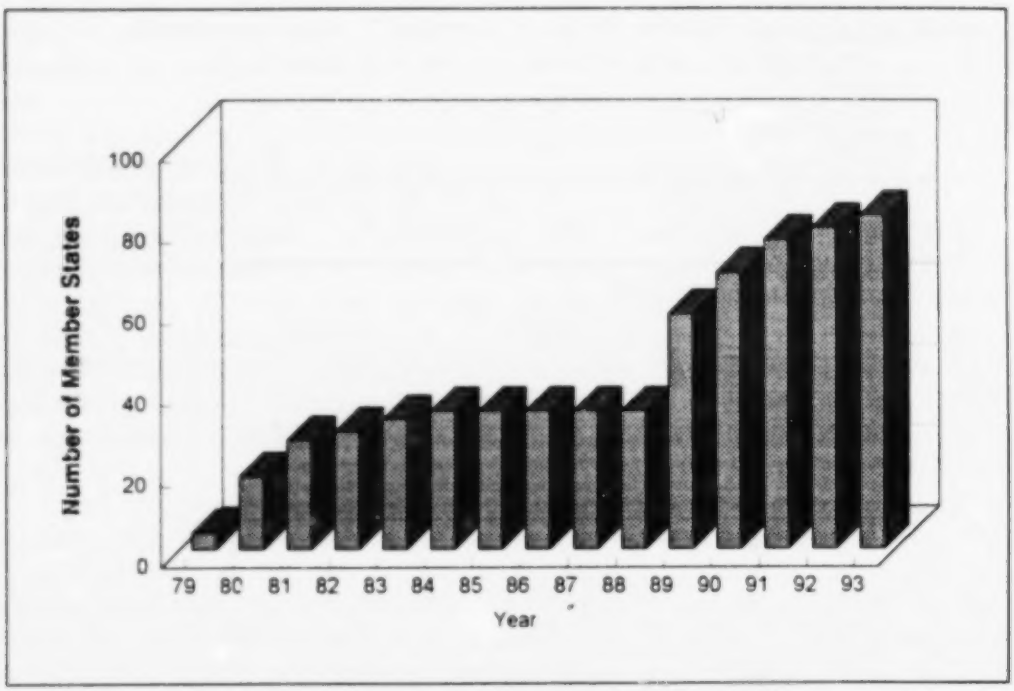

Figure 3 The number of TC recipient Member States having concluded a Revised Supplementary Agreement (RSA), concerning the provision of technical assistance by the IAEA.

Figure 3 shows the number of Member States, recipients of technical assistance in a given year, which have concluded a supplementary agreement with the Agency. The figure shows the success of the effort made since 1988 to bring almost all recipient countries under this agreement. After the break-up of the former Soviet Union and some countries in Central and Eastern Europe, a number of newly independent States joined the Agency during 1992 and 1993. The Agency responded immediately to requests for technical assistance in order to address some of the pressing problems in these countries although they had not yet signed the Agreement.

The TC Programme comprises projects with individual Member States (national projects), regional projects and interregional projects. Many of the regional projects fall within the framework of regional co-operative agreements to which Member States of the region may choose to be party. The interregional projects cover a range of nuclear applications and supporting activities which are of common interest to a large number of developing Member States worldwide, e.g. radiation protection, waste management, programming and implementation of nuclear-related activities, application of nuclear techniques in industry, hydrology and environmental research, in diagnosis and treatment of diseases common to all countries (cancer, heart diseases), as well as in agricultural research, production and processing. These global projects include some 20 training courses annually, together with 10-12 multi-year projects through which specific advice is provided to Member States in all geographical regions.

Assistance is requested by Member States on the basis of their needs and national priorities. All Member States are entitled to receive assistance; however, TC funds "... should be allocated primarily to meet the needs of developing countries ..." [INFCIRC/267].

The delivery of the TC Programme is facilitated by grouping recipient countries administratively (at present) into four regions: Africa, Latin America, Asia and Pacific, and Middle East and Europe. The countries within a region share many common features ranging from a history of intercountry co-operation to priorities in the application of specific nuclear technologies.

Common interests are also supported by co-operation among these countries through regional activities, which permit better use of resources while supporting inter-country co-operation, in particular Technical Co-operation among Developing Countries (TCDC).

3.1. TC Programme Areas

Projects in the TC Programme are grouped into ten categories (programme areas), reflecting the areas of national economy or infrastructure being supported in the Member States. These are: nuclear power; nuclear fuel cycle; radioactive waste management; food and agriculture; human health; industry and earth sciences; physical and chemical sciences; radiation protection; safety of nuclear installations; and direction and support.

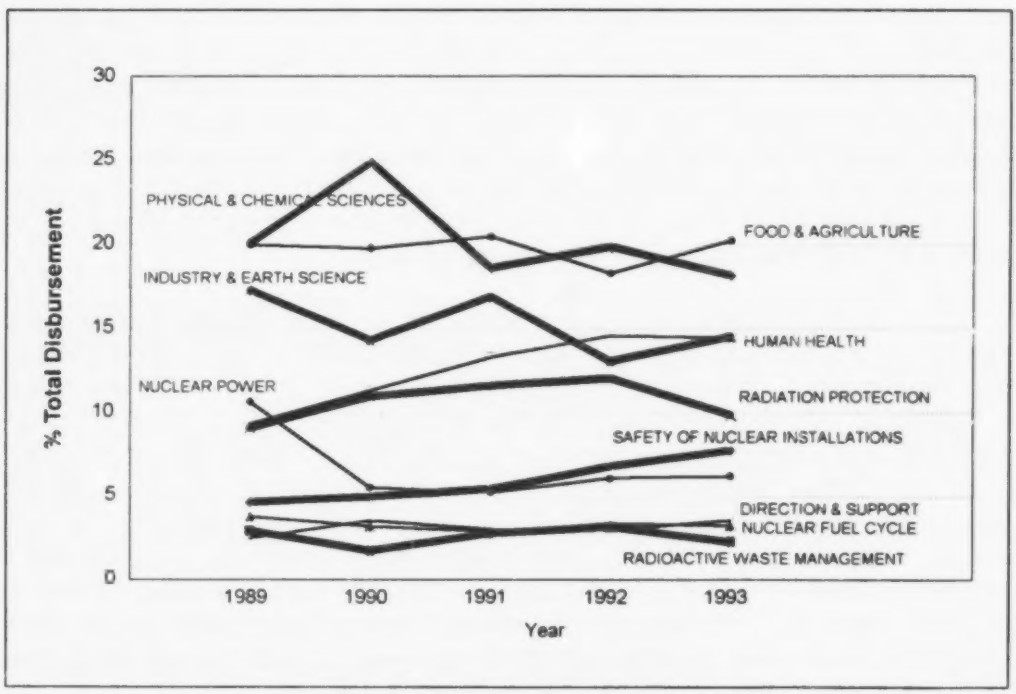

Figure 4 The percentage of total annual disbursements in each of the main programme areas of the IAEA.

Figure 4 shows the proportion of the total annual disbursements in each programme area, over the five-year period from 1989 to 1993, and illustrates the trends and changing directions of the TC Programme. High priority continues to be given to the applications of nuclear techniques in food and agriculture, the physical and chemical sciences and industry, highlighting one of the principal aims of the TC programme: to promote economic and scientific development in Member States. These particular programme areas cover a wide range of development sectors and represents a major part of the total programme. Disbursements in the areas of physical and chemical sciences ranged between 18% and 25%, while industry and earth sciences maintained an average share of about 15%. Recently, the largest portion of the programme has been devoted to food and agriculture, accounting for over 20% of disbursements in 1993. This reflects another vitally important aim which is to seek to improve the health, welfare and the quality of life of Member States' populations, particularly those of Least Developed Countries (LDCs).

For a number of reasons, nuclear power programmes in many countries have been cut back or halted. At the same time there is increased awareness of the needs for nuclear safety and radiation protection and the TC Programme has attempted to reflect the changing priorities by shifting emphasis accordingly. The share of disbursements from the programme on nuclear power has dropped from 12% to 6% since 1989, whereas the proportion allotted to safety and radiation protection measures has been increased. Direction and support activities have been maintained steadily at around 3% to improve the servicing and co-ordination of Technical Co-operation and thereby strengthening the capacity of Member States to absorb the assistance provided.

Another programme area which shows continued increase since 1989 is human health. Indeed the number of requests for assistance in the utilization of nuclear techniques for the diagnosis of many diseases such as leishmaniasis, Chagas disease, iodine deficiency diseases, sickle cell disease and thalassaemia and treatment by radiation therapy shows the high degree of interest and demand.

3.2. Types of Assistance Provided

The assistance available through the TC Programme is provided mainly through three components: experts, equipment and training (fellowships, scientific visits, training courses), that support the establishment or upgrading of nuclear techniques and facilities. A particularly important area is the provision of support to set up or improve regulatory practices and radiation safety infrastructures as a prerequisite for assistance in certain fields of activity.

Since 1970, under the Agency's TC Programme, over 16,000 scientists and specialists from developing Member States have been awarded fellowships or scientific visits, and about 17,000 participants have attended training courses. Almost 28,000 qualified experts have been assigned to assist development in Member States of technical areas where nuclear technology is involved. Related equipment and materials to the value of nearly $270 million have been delivered through technical co-operation projects.

3.3. Funding The TC Programme

Whilst the administrative cost of the technical co-operation projects and the technical support they require is fully borne by the regular budget of the IAEA, the assistance actually provided to the recipient countries is financed solely by voluntary contributions from Member States, made directly to the IAEA or through the United Nations Development Programme (UNDP).

Technical co-operation projects are financed from four separate resources:

- The Technical Assistance and Co-operation Fund (TACF)
- Extrabudgetary contributions
- In-kind contributions
- UNDP funds.

The **TACF** is the mainstay of the TC Programme, accounting for over three quarters of the total resources during the past few years. The bulk of the TACF is derived from voluntary contributions by Member States towards a target resulting from prior consultations. This target, which is now set for three or more years in advance, remained almost stationary during the first decade of the IAEA's existence. Since 1977 it has been increasing, reaching $55.5 million in 1993. Once the target is set, Member States are encouraged to pledge, paying a share of the target which is calculated essentially according to the rates used in the United Nations system for assessed contributions. It must be noted however that not all Member States pledge and pay according to their share (see Annex).

The second major resource is **extrabudgetary** income, made up of cash contributions from Member States in addition to their contributions to the TACF. This money is made available by donor countries to finance specific projects which have been appraised by the IAEA Secretariat as technically sound but which cannot be financed through the TACF owing to insufficient resources, (so called Footnote a/ projects).

A third type of voluntary contribution is '**assistance in kind**', whereby Member States provide expert services, donate equipment, or arrange fellowships, free of charge. Fellowships are of particular value to the TC Programme.

Finally, IAEA acts as executing agency for projects of the UNDP in areas involving nuclear science and technology and receives UNDP funds for the implementation of such projects.

The TACF has grown from modest beginnings of about $4 million in 1970 to a peak of almost $53 million in 1993, as illustrated in **Figure 5**, which shows the respective share of the TACF, extrabudgetary and UNDP resources available for technical co-operation. In terms of the nominal values, a steep increase in the programme until 1989 can be observed. UNDP funds accounted for more than 40% of available resources in 1975, but have dropped continuously since 1979 to about 2%. Extrabudgetary and in-kind resources combined have fluctuated between 10% and 30% in any given year since 1970.

Figure 6 shows the same information, now corrected for inflation. It can be seen that the increase of programmable resources in real terms is not as marked as implied when using nominal values. The decrease in UNDP activities since 1980 is also clearly visible. The sharp drop, both in nominal and real terms, in 1992 was due to the devaluation of the currency held by the Agency of a major donor country.

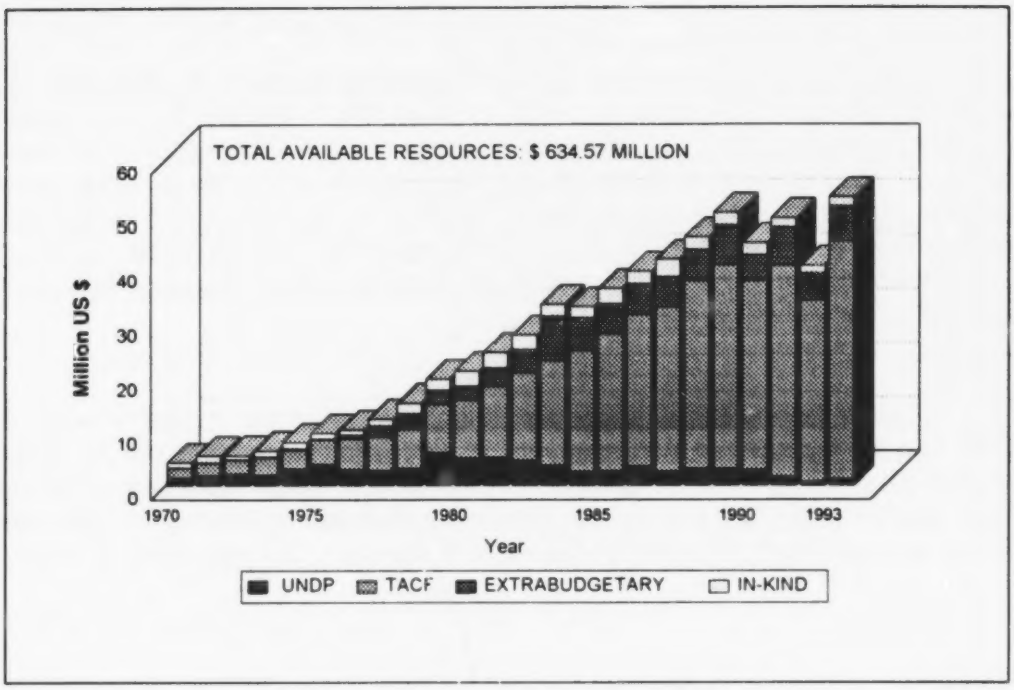

Figure 5 TC resources available by year and by source of funding.

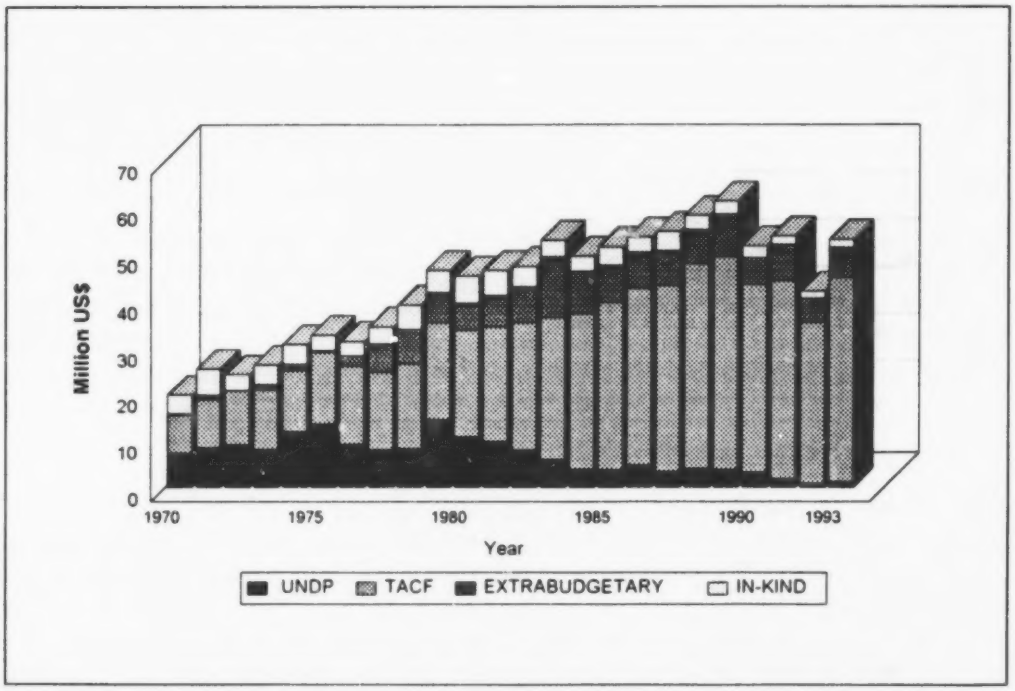

Figure 6 TC resources available by year and by source of funding, corrected for inflation using average annual OECD rates.

3.4. Technical Co-operation and NPT

In the preparation of the TC Programme, the Agency does not differentiate between NPT or non-NPT Member States. Projects are assessed exclusively in terms of technical and practical feasibility, national development priorities and long term advantages to end-users. This selection process is in accordance with the conditions for participating in the TC Programme as set out in INFCIRC/267.

What are the consequences of this policy? **Figure 7** to **Figure 9** shows the results of a survey undertaken for TC and Research Contract activities. **Figure 7** shows the disbursements from the TACF to Member States according to NPT status for each year since 1984. The proportion of disbursements from the TACF to non-NPT Member States has remained relatively constant, fluctuating between 16% and 20%.

The situation for extrabudgetary funding is quite different. As already stated, the value of projects approved for funding exceeds the resources available through TACF. Member States are then notified of the remaining projects as candidates for extrabudgetary support. The donor countries are free to choose the projects they are prepared to finance. Here, a clear preference is shown by donors for those in Member States party to NPT. indeed, certain Member States specifically express this preference during Board Meetings and when selecting projects to fund. **Figure 8** illustrates this situation. The proportion of disbursements from extrabudgetary funds to non-NPT Member States is much less, fluctuating between 2% and 5%.

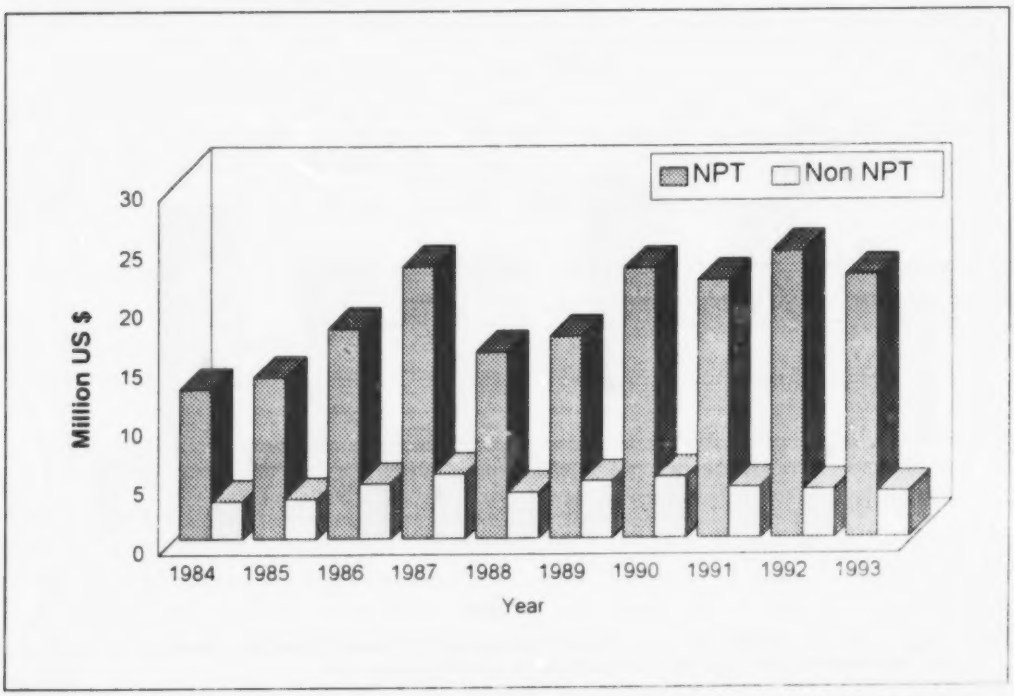

Figure 7 Disbursements from the TACF to Member States party and non-party to NPT.

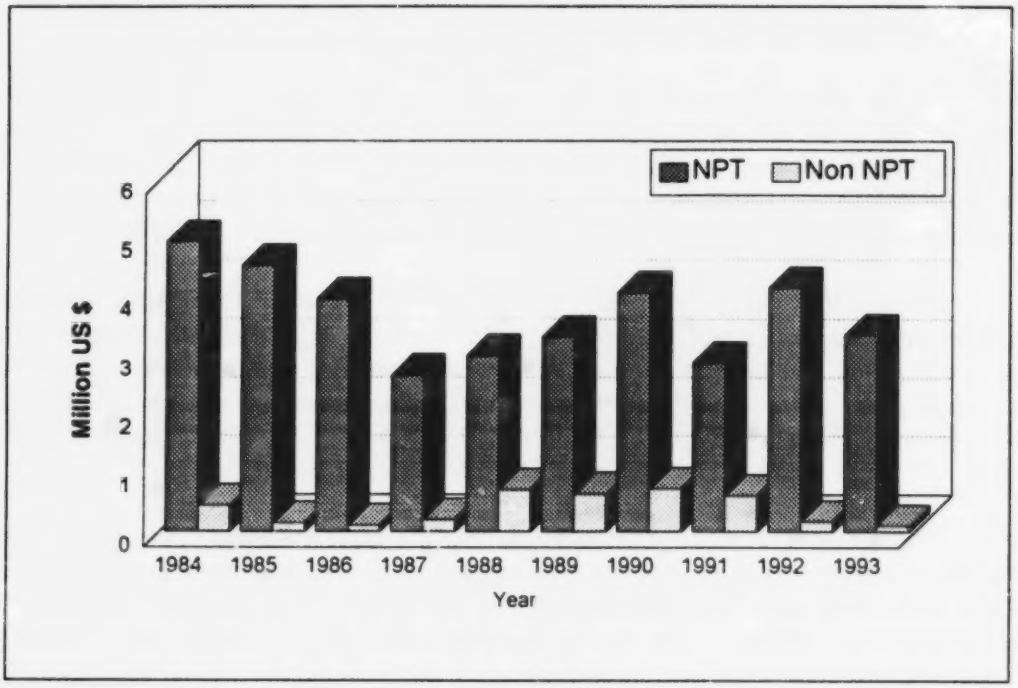

Figure 8 Extrabudgetary disbursements by Member States party and non-party to NPT.

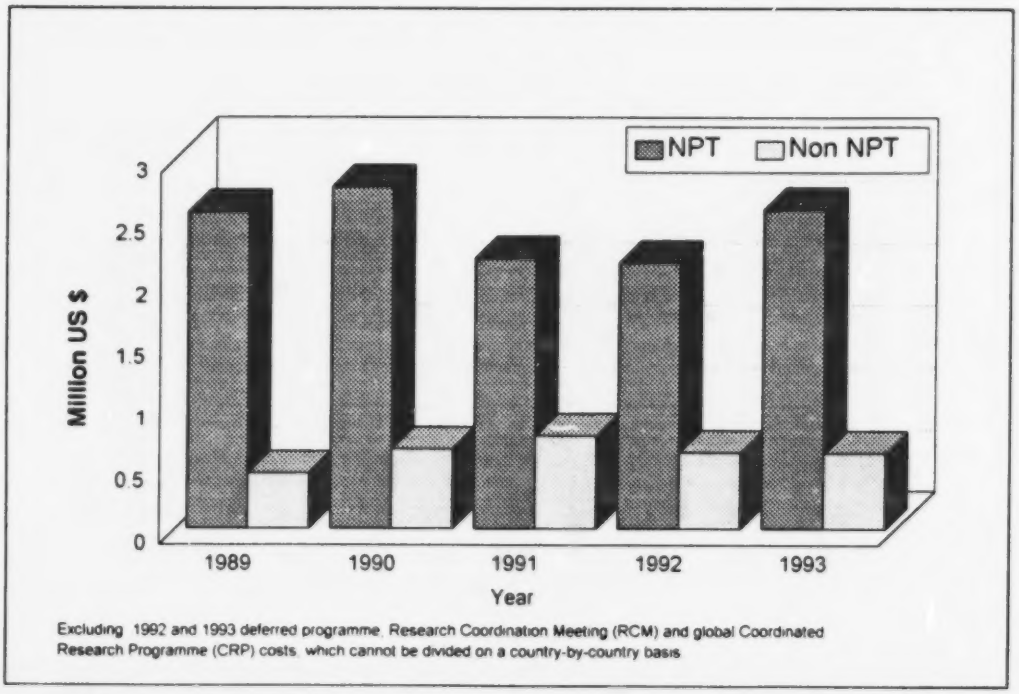

Figure 9 Research contract awards from the Regular Budget to Member States party and non-party to NPT.

Figure 9 shows the distribution by NPT status of Research Contract awards funded by the Regular Programme, for the five-year period 1989 to 1993.

4. TRENDS IN THE TC PROGRAMME

4.1. Diversity of Conditions and Needs

In considering the IAEA's technical co-operation activities, it should be noted that developing Member States differ widely in terms of overall economic development, and, in particular, advancement in nuclear science and technology.

Seventeen of the 32 nations operating or constructing nuclear power plants are developing countries. Some also possess nuclear fuel cycle technology and facilities, including such sophisticated techniques as uranium enrichment, reactor fuel fabrication, spent fuel reprocessing and heavy water production. Some of these countries are already exporting certain nuclear technologies and materials and are providing bilateral assistance to other States in research, development and applications of nuclear technologies. About five additional developing countries are planning to embark on nuclear power programmes in the near future.

Thirty-eight developing Member States operate 85 research reactors of various types and capacities. Nuclear scientific and technological infrastructures have been formed around the reactors, enabling these countries to conduct basic and applied research and development, radioisotope and radiopharmaceutical production, and other research reactor-related activities.

Most developing Member States have gained experience in the application of isotopes and radiation in many fields, including agriculture, medicine, industry and hydrology, and may be relatively advanced in some of them. At the same time there are Member States, particularly among LDCs, where nuclear activities consist mainly in the introduction of limited nuclear techniques and related training.

Thus, the widely differing technical assistance needs and priorities of individual Member States and of different groups of Member States make the Agency's technical co-operation activities highly diverse and prevent concentration on a limited number of applications and techniques.

One particular trend that has emerged in the last years is end-user orientation. Whereas previously, techniques were mostly transferred to specialist groups working at research establishments of national atomic energy commissions, training in and equipment for specific technologies are now increasingly delivered to the sectors concerned. For example, the end-users of medical diagnostic techniques are the hospital staff; the end-users of food irradiation technology are farmers' co-operatives and the food industry; the end users of isotopes in hydrology are the water management institutions.

4.2. Increased Intercountry Co-operation

Three major forms of intercountry technical co-operation activities are used by the Agency: regional co-operative agreements, with the principal aim of promoting and co-ordinating co-operative research, development and training projects in a wide range of nuclear applications and techniques; regional projects each of which deals with one specific nuclear technique or nuclear energy related activity; and interregional projects, normally addressing problems common to Member States in several geographical regions. The regional technical co-operation activities that started to be actively incorporated into the Agency's TC Programme in the late 1970s are an effective mechanism that permits problems common to several countries in one region to be addressed with an intensity of support that could not be provided to each country individually. Of no less importance is the fact that it promotes and facilitates Technical Co-operation among Developing Countries (TCDC).

At present there are three regional co-operative agreements: **AFRA** (Africa Regional Co-operative Agreement for Research, Development and Training); **ARCAL** (Regional Co-operative Agreement for the Development of Nuclear Science and Technology in Latin America); and **RCA** (Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology) for Asia and the Pacific Region. Regional membership has grown steadily and today 49 IAEA Member States are participating in these agreements.

These regional co-operative agreements are concluded under the auspices of the IAEA, which also acts as secretariat and co-ordinator in the formulation and establishment of projects. In fact, the Agency covers three main roles and fulfills three main functions: co-ordination, administration and scientific and technical support.

More than 30 multi-year regional projects are in operation, and about 40 regional training activities are carried out annually in addition to the activities within the regional co-operative agreements. The subjects of these projects and training courses reflect the priorities of the different regions.

The contribution of developing Member States to regional technical co-operation activities is increasing. These countries host the training events and in the case of Asia and Latin America provide most of the experts for the implementation of these agreements.

The expansion of the applications of nuclear techniques in developing Member States is expected to lead to an increasing trend towards regional co-operation and TCDC activities.

4.3. Increased Attention to Radiation Protection, Nuclear Safety and Radioactive Waste Management

Under its Statute, the Agency is authorized to establish or adopt standards of safety for the protection of health, life and property and to provide for their application to assisted operations. The Agency may also, if so requested, provide for the application of such standards to operations under bilateral or multilateral arrangements or to a State's own activities in the field of atomic energy. To enable the Agency to carry out these functions, the Statute provides that it shall have certain rights and responsibilities with respect to any assistance given.

To implement these statutory provisions, The Agency's Safety Standards and Measures contained in document INFCIRC/18 Rev.1 have been approved by the Board of Governors and is mandatory for the Agency's own operations and for Agency-assisted operations. In order to be able to apply the Standards effectively, each country must have in place a radiation safety infrastructure that includes:

- A legal framework for licensing or otherwise controlling practices involving exposure to radiation and radioactive substances;
- Provision of inspection and other compliance control activities;
- Technical capabilities to provide services such as radiation monitoring and emergency response;
- Qualified personnel to assess radiation protection programmes.

Over the years, the Agency has been assisting its developing Member States in establishing and strengthening their radiation safety (including waste management) infrastructures. A range of ways and means has been developed and is being used for this purpose, including technical meetings, provision of a large body of safety standards and guides, advisory missions, individual and group training, expert services and equipment. Most of these have been provided through the TC Programme: safety related activities — consisting of projects in the fields of radioactive waste management, radiation protection and the safety of nuclear installations — accounted for 20% of all TC disbursements in 1993, a share that has been slowly but steadily increasing from year to year.

In spite of these efforts, the radiation safety situation in many developing Member States still needs to be improved. A few countries have not yet established the appropriate infrastructure. In several other countries, although a minimum infrastructure is formally in place, the actual level of radiation safety is inadequate, mainly resulting from a lack of national support for such activities. **Radiation safety control mechanisms are deemed inadequate in more than half of the IAEA's developing Member States.** This situation, as monitored by the Agency, is shown in **Table 1**.

TABLE 1

Percentage of the IAEA Developing Member States
lacking some components of Radiation Protection Infrastructure

COMPONENTS MISSING	% FOR YEARS WHEN MONITORED		
	1984	1987	1993
General radiation protection law	28	22	16
Regulation/codes of practice	87	85	19
Licensing and inspection	74	70	43
Personnel monitoring	41	32	17
Emergency preparedness plans	86	78	43
Food contamination control	(-)*	88	21

*Not monitored in 1984

The continuing rapid growth in most developing countries in the application of nuclear techniques in agriculture, medicine, hydrology, industry, environmental surveillance and research makes the problem of radiation safety and waste management increasingly acute, requiring further enhancement of the Agency's co-operation and assistance in this direction. Therefore, in addition to large numbers of ongoing TC projects dealing with radiation safety, two interregional model projects were approved by the Board of Governors in 1993 that aim to support upgrading national infrastructures in radiation protection and waste management in a number of Member States to appropriate levels and standards as established by the Agency.

5. STRENGTHENING TRANSFER OF TECHNOLOGY

As Member States party to NPT represent the majority of IAEA membership, it is natural that their interests and requirements are specifically reflected in the Agency's medium term plans and biennial programmes. In preparing these plans and programmes, present situation and expected developments in the peaceful uses of atomic energy are assessed.

The growing world population will need more energy, particularly electricity, in the years ahead. The medium term period, therefore, will require much analysis of energy options at the national, regional and global levels, and important energy policy decisions are likely to be made. As there is no global intergovernmental energy organization, the IAEA will stimulate and, where necessary, co-ordinate the international efforts required to assess the benefits and problems of various power options including nuclear energy.

When considering the Agency's role in contributing to the transfer of nuclear power and fuel cycle technology, it should be recognized that the nuclear industry has made great progress in commercializing many technologies and that new suppliers have appeared on the market, some of them in developing countries. The IAEA's future role should be to find more ways of supporting and assisting buyers and to remove obstacles to free choice. The Agency's traditional function of providing a forum for information exchange in this area may expand in the future if demand for nuclear power increases and if this increase is followed by expanded development programmes in the field of power reactor technology and design. The Agency should also be ready to respond to requests for assistance from developing countries that are considering the nuclear option, particularly in the area of manpower training.

The increasing world population, with a major part living in developing areas, will also need greatly increased supplies of food and fresh water, better health care and greater access to industrial goods. Nuclear methods that can lead to improvements in the production and preservation of food, in health care, in industrial production and in the provision of water supplies are increasing in number. They are often competitive with other methods - and indeed in some cases they are the only methods available. The scope for the exchange of experience in using nuclear methods and for trasnferring these methods to developing countries is therefore expanding. Non-power applications of nuclear energy will remain the area of technology transfer of greatest interest for a large number of Member States.

The Agency's task in the medium term will almost invariably be to create or strengthen capabilities at the national level, primarily through the TC Programme. Achieving this goal will require greater precision in identifying those areas where assistance will have the most impact.

A high priority among the Agency's activities in the medium term will be given to nuclear safety, radiation protection and waste management for further expansion of the application of nuclear techniques in the various sectors of national economies.

On the basis of the above assessments and forecasts, three overall objectives were formulated for the Agency's medium term activities. The following two of these objectives fall predominantly into the context of discussions at the 1990 NPTRC on Article IV of the Treaty.

5.1. Enhancing Technical Co-operation

The objective is to enhance the transfer of nuclear technology and know-how to developing countries, specifically:

(a) To ensure, through increased interaction with the responsible governmental authorities, that the Agency's technology transfer activities are **in line with national development plans.** The aim of Agency assistance will be to strengthen the relevant national infrastructures so that they become self-supporting. Manpower development, quality control services and maintenance of nuclear instrumentation will receive more attention under this strategy. In view of the important role of the TC Programme in achieving these objectives, the traditional means and procedures for technology transfer are being reviewed to ensure delivery of a high quality programme.

(b) To help establish and strengthen national nuclear safety, radiation protection and waste management systems as a prerequisite for the development of nuclear energy programmes, mainly through the provision of training and advice.

(c) To give priority, when selecting areas for co-operation, to provision of assistance in the transfer of technology to areas involving basic human needs, such as food and water resources, health, and energy supply, and to the transfer of techniques contributing to environmental protection and **sustainable development**.

(d) To promote only those nuclear techniques in developing countries which have a clear advantage over other techniques, to this end, comparing nuclear and non-nuclear techniques, taking into account the conditions prevailing in the recipient countries.

(e) To co-operate with the relevant international organizations in establishing appropriate databases and systematically analysing the economic, health, environmental and climatic impacts of various energy options; in particular to contribute analyses and data concerning nuclear power to such studies and to make the results of this work widely available to experts in Member States.

(f) To promote the exchange of information and international discussions with interested Member States, and such parties as World Association of Nuclear Operators (WANO) and international financial institutions, with the aim of developing new schemes for financing, constructing and operating nuclear power plants in developing countries.

(g) To perform global analyses and strategic studies of selected aspects of nuclear power and the fuel cycle, including assurance of supply.

5.2. Achieving and Maintaining a High Level of Nuclear Safety

The objective is to provide international leadership and assistance in achieving and maintaining a high level of nuclear safety worldwide and minimizing the environmental impact of all types of peaceful nuclear facilities and applications, specifically:

(a) To provide international leadership and assistance to national nuclear safety authorities, especially to governmental nuclear regulatory bodies, with a view to detecting and correcting safety deficiencies in operating nuclear facilities and the prevention of accidents. To this end:

- To develop and implement a more thorough and transparent system to overview the safety of all operating nuclear installations;
- To develop a common basis for judging the acceptable level of safety of all operating nuclear power plants built to past safety standards, with direct assistance provided to Member States in performing periodical reviews of such plants and in assessing and monitoring the effects of ageing on safety.

(b) To co-ordinate the efforts of international and national bodies in reaching a consensus on safety principles for the design of future nuclear power plants.

(c) To take the lead in developing an international technical consensus on the acceptability of methods for the management and disposal of nuclear waste of all kinds, and to help gain public confidence in these matters.

(d) To provide expanded international guidance and assistance to national nuclear safety authorities to ensure the safety of research reactors, spent fuel management facilities and installations using radiation sources, with special attention to the larger research reactors and irradiation facilities.

(e) To establish a harmonized international approach to all aspects of nuclear safety, including the incorporation of the recommendations of the International Commission on Radiological Protection (ICRP) into the Agency's standards and guides.

6. CHALLENGES TO TECHNICAL CO-OPERATION

With the increase in diversity and complexity of nuclear techniques and technology, and with the rapid growth of the needs of developing countries for more sophisticated tools to solve difficult problems, their societies and economies face, technical co-operation programme of the Agency has to deal with several new challenges of diverse nature.

6.1. The Environment and Sustainable Development

A number of problems identified by the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992 and summarized as "**Agenda 21**" under the broad concept of "sustainable development" fall within the Agency's mandate. These are being or are about to be addressed through the TC and Regular Programmes. Nuclear techniques are directly relevant to many of the items in "Agenda 21".

Many of the Agency's technical co-operation activities have direct relation to **sustainable development**, for example, projects in the areas of food and agriculture, animal husbandry, water resource management, and the promotion of human health.

Of particular interest are the Agency's efforts to promote the use of techniques that minimize or even eliminate the environmental impact of certain human activities. For example, industrial radiation sterilization of a broad range of medical products has replaced earlier processes that used highly toxic gases which were released to the atmosphere. Electron-beam processing technology applied to flue gases of fossil fuel-burning plants to reduce toxic emissions of SO_2 and NO_x into the atmosphere.

"Agenda 21" calls upon individual countries to create policies that minimize the generation of radioactive wastes and promote their safe storage, transport and disposal. The Agency takes the leading international role in the area of radiation protection and safety, including management of radioactive wastes.

6.2. New Member States and their Needs

Following the political and economic changes that took place lately in Central and Eastern Europe, several newly independent States have joined the Agency and others are taking the necessary steps to that effect. Many of these countries face major problems arising from previous programmes in nuclear power utilization, weapons development and nuclear techniques applications. Technical assistance is needed to replace defunct infrastructures, establish regulatory bodies, train manpower, and support implementation of remedial measures to upgrade nuclear facilities to modern operational and safety standards, while bringing environmental problems under control. As a basis for these activities, the countries concerned need to establish internationally proven regulatory practices relating to the licensing, control and inspection of their nuclear facilities. They also need to prepare for decommissioning of a number of these facilities in the near future.

It must be recognized that certain radiation protection and safety issues in Central and Eastern European and former Soviet Union States deriving from past and existing nuclear activities, pose considerable problems. These will need to be tackled in ways that, in many cases, have yet to be determined.

Several initiatives have been undertaken by international organizations to address these problems, but more needs to be accomplished. A joint UNDP-IAEA forum was held in Vienna in 1993 to foster information exchange and to seek technical support and funding. Ministers and senior officials of the affected countries attended. As a follow up to this forum, detailed and thorough fact finding missions have been fielded to several former Soviet Union States to gather technical information and evaluate requirements, including manpower development needs. Apart from raising awareness of the needs and problems, it is highly desirable that the resources are forthcoming. So far however these funds for remedial actions have not been secured. It is believed that the Agency's experience in seeking and gaining international support for such activities will play a major role in solving the problems that are being identified — a role that will continue in some cases for at least a decade. In view of the urgency to start action, the Agency will begin under the 1995-1996 TC programme a $2.7 million regional project to assist the implementation of safety improvements in Russian designed nuclear power plants.

6.3. Impact of Technical Co-operation

A major challenge for the Agency and the Member States involved in the TC Programme is to maximize the **impact** of the individual projects at the country level. The impact can be reasonably assessed only in terms of the change achieved in some measurable factor, for example greater availability of electrical energy, better product quality using non-destructive testing techniques, or better public health because of improvements in and increased use of nuclear techniques for diagnosis and treatment.

All these factors depend on the continued use of the technology or techniques by the country after the Agency input has been delivered. Sustainability is created at the national level through for example the absorptive capacity for a technique, a stable manpower situation and continued financial support. However, the prime factor is the perception at government level of the importance of the technology or technique in terms of national development priorities and goals.

A start has been made by sending **Country Programme Review Missions** in response to requests by Member States to help define the national programme of technical co-operation with the Agency. These missions help the government select meaningful technical co-operation inputs in line with national development plans and priorities, i.e. ensuring project "relevance". It is only by ensuring government awareness of the relative values of nuclear technologies, and of their respective impacts on achieving national goals, that a government commitment can be assured. Such assurance is essential if Agency inputs are not to support activities that, while important to specific groups in the country, are of limited or no importance in the overall national or sectoral plan as seen by the government, and that will therefore cease if

Agency support is withdrawn. In 1993 nine Country Programme Review Missions were undertaken, and in the first six months of 1994 a further three were fielded. When a request is received for assistance in the design of a specific project, the Agency is prepared to mount **Pre-Project Missions**. Both mechanisms appear to be effective in assisting Member States to maximize the relevance, feasibility and hence the benefits, of the proposed project with the Agency. The more obvious the benefits of a given project and its associated technology, the greater will be the government's interest in continuing the activity.

6.4. Advanced Technologies and Techniques

For over three decades, the IAEA's technical co-operation activities have been geared to establishing and strengthening national infrastructures, in order to enable developing Member States to use nuclear techniques in various areas of research and applications. With the Agency's assistance, many recipient countries made big progress in this respect by the early 1990s. Nuclear research laboratories or groups had been established in many research institutions and scientific centres; large numbers of local scientists and specialists had obtained nuclear related knowledge and skills through a wide range of training opportunities (fellowships, training courses, expert services); and nuclear regulatory and administrative systems had been established in most developing Member States.

However, as countries achieve higher levels of development, with growing proportions of their societies enjoying the benefits, their needs will increase in all areas, including science and technology. Indeed, many developing Member States that have enjoyed technical co-operation with the Agency for several years have reached high levels of sophistication in the application of nuclear techniques. Therefore, **new projects** for continuing the development of national economies **have become more advanced, more complex, and larger** in terms of both implementation and funding.

For example, requests are increasing for assistance in establishing radioisotope production facilities (research reactors or cyclotrons), or in support of power reactor maintenance and safety activities (probabilistic safety analysis training) and environmental monitoring and remediation programmes (nuclear analytical techniques, radioactive tracer techniques, removal of SO_2 and NO_x from flue gases emission....).

Implementation of such large and complex projects requires not only a serious, long term commitment from both Agency and recipient country, but also, in many cases, **complementary bilateral co-operation** to achieve the objectives.

6.5. Public Acceptance of Nuclear Technology

In view of public sensitivity about the acceptance of nuclear power and application of nuclear techniques in such areas as agriculture, food preservation and health, the Agency will need to continue wider dissemination of relevant information on the various aspects of nuclear applications. The acceptance is based on the public's perception of "risk" and "necessity". For example, medical diagnostics or treatment of

cancer using nuclear techniques and radiation are rarely objected to while nuclear power or the irradiation of foodstuffs to improve food safety are frequently rejected.

The issue of public acceptance, however, must be primarily addressed at the national level with due participation of the atomic energy commissions as well as concerned government departments and the media. It remains for the Member States to determine whether and to what extent the IAEA should contribute to a well-informed public debate on nuclear technology and applications.

7. MEETING THE CHALLENGES

The IAEA is recognized by most governments as an **independent source of advice and assistance**, serving as a clearing house for information on all aspects of nuclear technology, including regulatory and radiation protection and safety issues. Furthermore, it is accepted as an "honest broker" between Member States wishing to collaborate either through Agency mechanisms or bilaterally with Agency support.

The application of nuclear techniques in areas involving basic human needs, radiation protection, nuclear safety, radioactive waste management, environmental protection and sustainable development, are major issues drawing particular attention from the Agency and its Member States.

To meet the many and diverse challenges, two courses of action are deemed necessary. The first is to review and redirect technical co-operation to ensure that **technology transfer** is achieved. The second is to ensure that the necessary financial resources are available at the level required to respond to the genuine needs of Member States once priorities have been carefully set and agreed by the Agency and the States concerned.

7.1. Redirection of Technical Co-operation Activities

Agency assistance has been effective in establishing and strengthening national infrastructures to enable Member States to exploit nuclear techniques. Each country builds on this foundation its future programme of peaceful applications of atomic energy. The prime responsibility for utilizing the infrastructure lies with the individual Member States.

Indeed, proven government commitment, a valid project objective and a clear benefit to an identified end-user are the primary considerations when projects are being appraised for inclusion in the TC Programme.

In view of these factors, the Agency is seeking to ensure that its technical co-operation projects are **in line with the Member States' national development plans,** are of a **practical** nature, are oriented towards the **end-user**, and are intended to have a significant **impact** on the development of the countries concerned. Special emphasis

is being placed on projects which combine all of the above features. They are identified as **model projects** and are intended to serve as beacons for the direction in which the TC Programme is gradually moving.

Intensive discussions concerning a gradual redirection of technical co-operation activities have stimulated efforts within the Agency towards more rational planning and implementation of individual projects and programmes. A concept of integrated handling of all forms of technical co-operation (national, regional, interregional) in one area of nuclear application (e.g. nuclear techniques in food production) or nuclear-related activity (e.g. radiation protection) has been proposed. For projects of similar scientific content and of recurrent nature the establishment of standard technical assistance **packages** which might include experts, training courses, fellowships and equipment are being considered.

7.2. Meeting The Needs of Member States

What does this changing pattern mean in terms of funding the Agency's technical co-operation activities? Surprisingly, the additional resources required are remarkably small in relation to the importance and magnitude of the tasks ahead.

The historical evolution of the funding of the TC Programme since the establishment of NPT can be seen by referring back to **Figure 5** and **Figure 6**. In the last five years the delivery has fluctuated around a rather constant value, some $40 million per year, reflecting the various influences from both donors and recipient Member States.

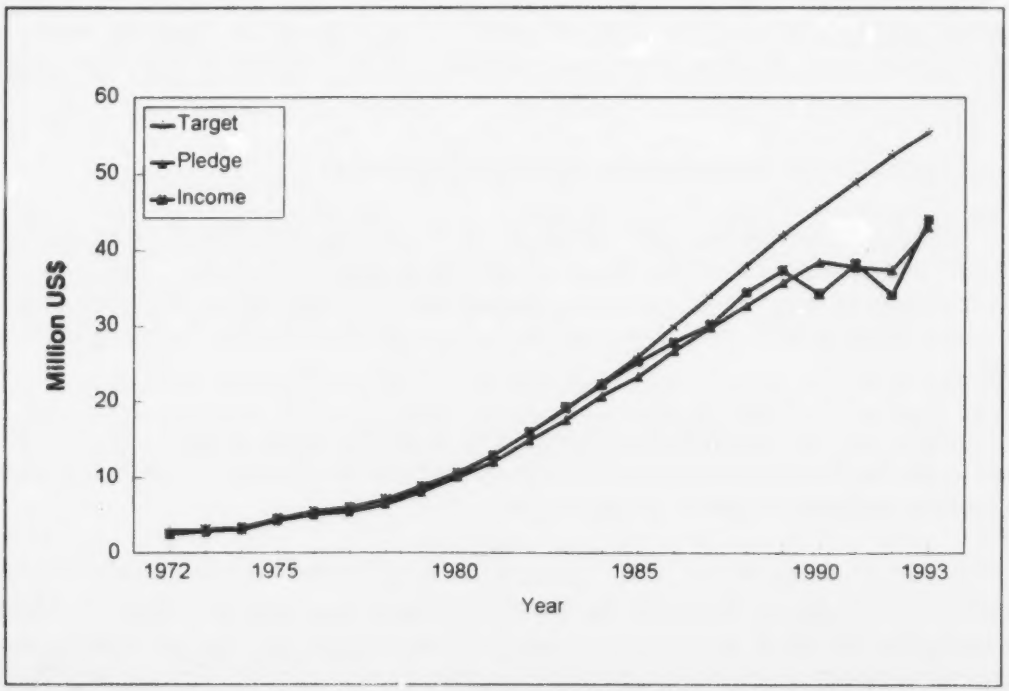

Figure 10 Pledges and income compared with target contributions to the TACF by year

Figure 10 shows the situation in respect of pledges and payments towards the TACF target set for the TC Programme from 1972 to 1993. As has been described in Section 3.3, the target contribution to the TACF results from prior consultations. Member States are then encouraged to pledge in full their respective targets. The actual payments made to the TACF may differ from the pledge, which may in turn differ from the target. For the first decade (1973-82) the percentage of the target pledged was above 90% and almost all pledges materialized. However, from 1983 onwards many Member States stopped or decreased their pledge *vis-à-vis* their calculated share. The result was a dramatic decrease in the income as percentage of the target which reached the bottom level of 60% in 1992.

The next effect was that the benefits of an increasing target were completely annihilated by the decrease in payments, hence the decrease of benefits to developing Member States. The shares, pledges and payments received in 1993 are shown in the **Annex**.

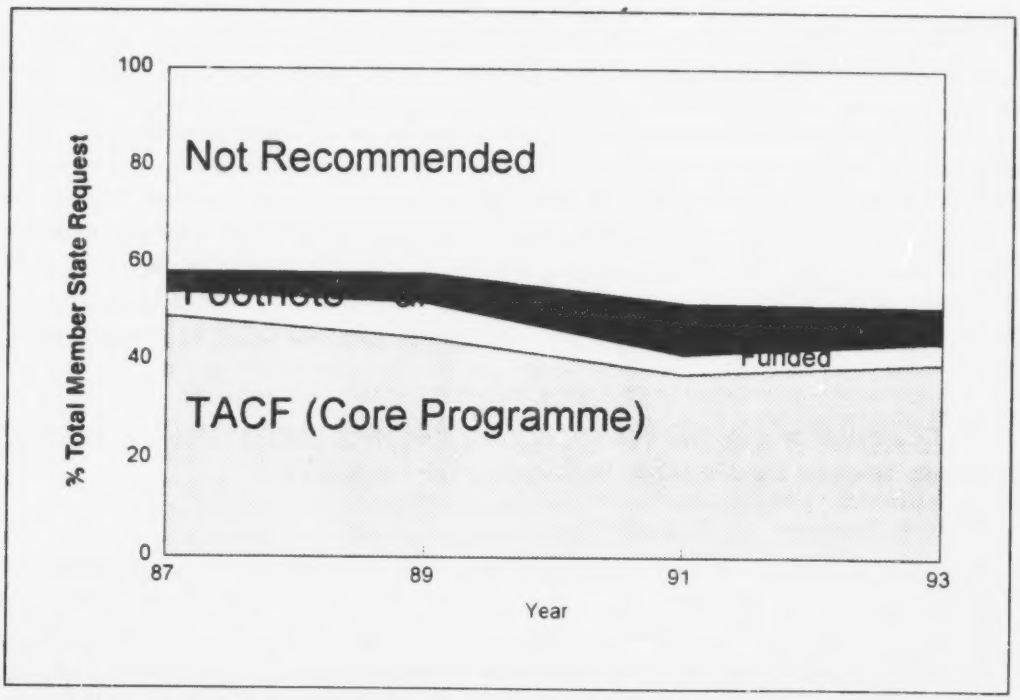

Figure 11 The TC Programme by year divided into a core component, and financed and unfinanced Footnote a/ components, shown as a proportion of the total request for technical assistance by Member State Governments.

Figure 11 shows the value of the total requests for technical assistance by Member States, (represented by the 100% line) for the period 1987 to 1993. These requests undergo appraisal by the Agency and a TC programme is proposed by the Secretariat to the Board for approval (shaded area). It should be noted that the approved programme represents only about 50% of the initial demands coming from developing Member States. The portion indicated as "Core Programme" represents the percentage of the programme in a given year, funded by the TACF. The Footnote a/ portion corresponds to the additional resources (extrabudgetary) necessary to cover the approved programme.

From this figure it can be concluded that, during the period considered, between 6% and 20% of the approved TC Programme remained "unfunded" and could not therefore be implemented. If projected to the next programme cycle (1995-96) it means that about $13.5 million per year of additional contribution would be required for the implementation of the entire approved programme. A concomitant supplement to the Agency's Regular Budget would be needed to manage the expanded activities.

8. CONCLUSION

From the present overview it can be seen that the IAEA undertakes a multitude of activities which are in line with Article IV of the NPT, and has substantially contributed to the promotion of nuclear energy and its applications in developing Member States. In fact, for most of these countries, Agency-supported projects provided key inputs to the establishment of national infrastructures required for the introduction of nuclear techniques in such areas of basic human needs as food production and supply, public health, industry and environment, as well as energy generation and related safety issues.

The overview also shows that the Agency's existing mechanisms and practices for nuclear technology transfer have the following main strengths:

- Transfer of technology and techniques has always ranked highly among the main objectives of the Agency which also include the establishment of health and safety standards, the development and implementation of safeguards and extend to such matters, as, for example, the establishment of guidelines and an international convention relating to the physical protection of nuclear materials. As a result, there has been a steady growth of resources and an extensive involvement of the Agency's overall efforts in technology transfer activities, both under the TC Programme and the Regular Programme. Indeed the growth in resources for the TC Programme has been proportionally much greater than for activities relating to the Agency's other main objectives which are financed from the Regular Budget, to which the principle of zero real growth continues to apply.

- The Agency has a well-established mechanism for considering policy matters and operational issues related to technical co-operation. This includes regular sessions of the Policy Making Organs, the Technical Assistance and Co-operation Committee (TACC), periodic TC Policy Review Seminars, *ad-hoc* advisory groups of external consultants, systematic internal evaluation of project performance etc, which enable necessary in-depth reviews to be undertaken. By these means, the Agency is able to identify, generally in good time, the modifications and technical adjustments necessary to maintain the efficiency and quality of its assistance.

- Technical co-operation plays an important role in tune with the process of development of recipient nations.

This overview also shows that there is plenty of scope for improvement of technology transfer, using both bilateral and multilateral channels, and hence contributing to bridging the technological gap between developed and developing countries.

In view of its structure, experience in technical co-operation and mechanisms of control, the IAEA provides a unique opportunity to all countries for the furtherance of the utilization of nuclear energy for peaceful purposes as envisaged by Article IV of the NPT.

GLOSSARY

Adjusted programme - the total value of all technical co-operation activities approved for a given calendar year plus all approved assistance brought forward from previous years but not yet implemented.

Disbursements - actual cash outlays for goods provided and services rendered.

Earmarkings - amounts allotted for funding approved assistance awaiting implementation.

Extrabudgetary funds - funds provided by Member States for financing specific projects or activities. These funds are separate from voluntary contributions to the Technical Assistance and Co-operation Fund.

Footnote a/ projects - projects approved by the Board for which no immediate funds are available.

Funds in trust - funds received from Member States to finance assistance for themselves.

Implementation - the volume of funds obligated (new obligations) in a given period.

Implementation rate - a ratio obtained by dividing implementation by the adjusted programme (expressed as a percentage).

Technical Assistance and Co-operation Fund - at present, the main fund for the financing of the Agency's technical co-operation activities; it is supported by voluntary contributions from Member States.

UNDP Programme - projects executed by the Agency on behalf of UNDP and its associated funds, including UNFSTD.

ANNEX

VOLUNTARY CONTRIBUTIONS TO THE TECHNICAL ASSISTANCE AND CO-OPERATION FUND FOR 1993

AS AT 30 JUNE 1994

	1993				Over payments
	Target	Pledged	Paid	Outstanding	
Afghanistan	5,550	0	0	0	
Albania	5,550	0	0	0	
Algeria	88,800	45,000	45,000	0	
Argentina	310,800	270,000	270,000	0	
Australia	832,500	831,979	831,979	0	
Austria	410,700	410,700	410,700	0	
Bangladesh	5,550	5,550	5,550	0	
Belarus	172,050	0	0	0	
Belgium	582,750	0	0	0	
Bolivia	5,550	0	0	0	
Brazil	876,900	250,000	0	250,000	
Bulgaria	72,150	10,000	10,000	0	
Cambodia	5,550	0	0	0	
Cameroon	5,550	0	0	0	
Canada	1,714,950	3,081,261	3,081,261	0	
Chile	44,400	44,400	44,400	0	
China	421,800	421,800	421,800	0	
Colombia	72,150	55,000	55,000	0	
Costa Rica	5,550	0	0	0	
Cote d'Ivoire	11,100	0	0	0	
Cuba	49,950	49,950	49,950	0	
Cyprus	11,100	0	0	0	
Democratic People's Republic of Korea	27,750	27,750	27,365	385	
Denmark	355,200	355,200	355,200	0	
Dominican Republic	11,100	0	0	0	
Ecuador	16,650	0	0	0	
Egypt	38,850	38,851	38,851	0	
El Salvador	5,550	0	0	0	
Ethiopia	5,550	0	0	0	
Finland	310,800	310,800	310,800	0	
France	3,302,250	3,302,250	3,302,250	0	
Gabon	11,100	0	0	0	
Germany	4,917,300	4,917,300	4,917,300	0	
Ghana	5,550	0	0	0	
Greece	194,250	194,250	194,250	0	
Guatemala	11,100	11,100	0	11,100	
Haiti	5,550	0	0	0	
Holy See	5,550	0	0	0	
Hungary	99,900	99,900	99,900	0	
Iceland	16,650	16,650	16,650	0	
India	199,800	199,800	199,800	0	
Indonesia	88,800	39,000	39,000	0	
Iran, Islamic Republic of	421,800	16,892	16,892	0	
Iraq	72,150	0	0	0	
Ireland	99,900	8,311	8,311	0	
Israel	127,650	0	0	0	
Italy	2,364,300	0	0	0	
Jamaica	5,550	0	0	0	
Japan	6,859,800	6,859,800	6,859,800	0	
Jordan	5,550	0	0	0	
Kenya	5,550	0	0	0	
Korea, Republic of	377,400	244,755	244,755	0	
Kuwait	138,750	0	0	0	
Lebanon	5,550	0	0	0	
Liberia	5,550	0	0	0	
Libyan Arab Jamahiriya	133,200	0	0	0	
Liechtenstein	5,550	5,600	5,600	0	
Luxembourg	33,300	0	0	0	
Madagascar	5,550	1,600	0	1,600	
Malaysia	66,600	66,600	66,600	0	
Mali	5,550	0	0	0	
Mauritius	5,550	0	0	0	
Mexico	482,850	482,850	482,850	0	
Monaco	5,550	0	0	0	
Mongolia	5,550	0	0	0	
Morocco	16,650	16,650	16,650	0	
Myanmar	5,550	0	0	0	
Namibia	5,550	0	0	0	
Netherlands	826,950	826,950	826,950	0	
New Zealand	133,200	0	0	0	

VOLUNTARY CONTRIBUTIONS TO THE TECHNICAL ASSISTANCE AND CO-OPERATION FUND FOR 1993

AS AT 30 JUNE 1994

	1993					Over payments
	Target	Pledged	Paid	Outstanding		
Nicaragua	5,550	0	0	0		
Niger	5,550	0	0	0		
Nigeria	111,000	111,000	111,000	0		
Norway	305,250	305,250	305,250	0		
Pakistan	33,300	33,300	33,300	0		
Panama	11,100	0	0	0		
Paraguay	11,100	0	0	0		
Peru	33,300	0	0	0		
Philippines	38,850	11,000	11,000	0		
Poland	260,850	260,850	260,850	0		
Portugal	111,000	50,000	50,000	0		
Qatar	27,750	0	0	0		
Romania	94,350	94,350	43,262	51,088		
Russian Federation	5,183,700	60,789	60,789	0		
Saudi Arabia	527,250	0	0	0		
Senegal	5,550	0	0	0		
Sierra Leone	5,550	0	0	0		
Singapore	66,600	0	0	0		
South Africa	227,550	0	0	0		
Spain	1,087,800	168,695	168,695	0		
Sri Lanka	5,550	0	0	0		
Sudan	5,550	0	0	0		
Sweden	610,500	610,500	610,500	0		
Switzerland	638,250	638,250	638,250	0		
Syrian Arab Republic	22,200	2,000	2,000	0		
Thailand	61,050	61,050	61,050	0		
Tunisia	16,650	16,650	16,650	0		
Turkey	149,850	149,850	149,850	0		
Uganda	5,550	0	0	0		
Ukraine	649,350	0	0	0		
United Arab Emirates	116,550	0	0	0		
United Kingdom of Great Britain and Northern Ireland	2,763,900	2,714,080	2,714,080	0		
United Republic of Tanzania	5,550	5,500	0	5,500		
United States of America	13,875,000	13,875,000	13,175,000	700,000		
Uruguay	22,200	15,000	0	15,000		
Venezuela	271,950	0	0	0		
Viet Nam	5,550	5,550	5,550	0		
Yugoslavia	233,100	0	0	0		
Zaire	5,550	0	0	0		
Zambia	5,550	5,550	0	5,550		
Zimbabwe	5,550	0	0	0		
Sub-total	**55,194,750**	**42,712,693**	**41,672,470**	**1,040,223**		**0**
New Members:						
Czech Republic a/	233,100	233,100	233,100	0		
Slovak Republic a/	72,150	72,150	72,150	0		
Sub-total	**55,500,000**	**43,017,943**	**41,977,720**	**1,040,223**		**0**
Armenia b/	72,150	0	0	0		
Croatia c/	72,150	0	0	0		
Estonia d/	38,850	0	0	0		
Lithuania e/	83,250	0	0	0		
Slovenia f/	49,950	49,950	49,950	0		
TOTAL	**55,816,350**	**43,067,893**	**42,027,670**	**1,040,223**		**0**

a/ The Czech Republic and the Slovak Republic became Members of the Agency on 27 September 1993.
b/ Armenia became a Member of the Agency on 27 September 1993.
c/ Croatia became a Member of the Agency on 12 February 1993.
d/ Estonia became a Member of the Agency on 31 January 1992.
e/ Lithuania became a Member of the Agency on 18 November 1993.
f/ Slovenia became a Member of the Agency on 21 September 1992.